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SOME ASPECTS ON PHARMACOGNOSY OF TEN SPECIES OF THE FAMILY SOLANACEAE UTILIZED IN TRADITIONAL MEDICINE

Algunos aspectos de la farmacognosia de diez especies de la familia Solanaceae empleadas en medicina tradicional

R. K. Maiti [1,2]
L. Villarreal R.[1]*
A. Treviño V. [1]
M.C. Valades-Cerda [1]
[1]*Facultad de Ciencias Biológicas. Universidad Autónoma de Nuevo León. Apdo. Post. F-16, C.P. 66450. San Nicolás de los Garza, N.L. Mexico.*
[2]*Universidad de las Americas, Departamento de Quimica y Biologia, Santa Catarina Martir, C.P.72820, Cholula, Puebla, Mexico.* (**rmaiti@mail.udlap.mx*)

ABSTRACT
In the present work ten species of the family Solanaceae were studied applying techniques of pharmacognosy and histochemistry for the differentiation and identification of each of the species. The anatomical characteristics used in the differentiation of the species are the types of trichomes, stomatas, crystals, glands, and position of pallisade parenchyma. In the histochemical tests the species present different grades of reaction in the contents of proteins, tannin, and alkaloids.

Key words. Pharmacognosy, Histochemistry, traditional medicine, Solanaceae.

RESUMEN
Se estudiaron diez especies de la familia Solanaceae mediante las técnicas de farmacognosia e histoquímica. Las características anatómicas empleadas en la diferenciación de las especies incluyen los tipos de tricomas, estomas, cristales, glándulas y la posición del parenquima. En las pruebas histoquímicas las especies presentan diferentes grados de reacción en los contenidos de proteínas, taninos y alcaloides.

Palabras clave. Farmacognosia, histoquímica, medicina tradicional, Solanaceae.

INTRODUCTION

Since remote time men have been utilizing the plants and animals as souces of food. The plants have been classified and grouped on the basis of utility: food, medicinal, textile and timbers (Milliken and Albert, 1996)..The vegetation of Mexico is rich, showing great diversity. The family Solanaceae include a large number of species which grow mainly in the tropical and temeperate regions; rich in alkaloids of medicinal values. Some of these plants have great economic importance.

Actually, the use of the plants in traditional medicine has been replaced by the advances in modern medicine. Besides mens have been utilizing as immediate alternatives in the marginal community and also in the cities.

This study pretend to contribute to the knowledge of some medicinal species of the family Solanaceae utilizing the techniques of pharmacognosy (Maiti et al. 2001)..

MATERIALS AND METHODS

A revision has been made in the herbarium of Biology Faculty, (UANL) to produce a list of the species of the family Solanaceae reported for the state of Nuevo León used for medicinal purpose. With this information the selected plants were collected from the fields and identified with the help of taxonomic key. The species studied were: *Dattura inoxia* Mill., *Datura stramonium* L., *Lycopersicum esculentum* Mill., *Nicotiana glauca* Grah., *Physalis viscosa* L., *Solandra nitida* Swarttz, *Solanum elaeagnifolium* Cav., *Solanum erianthum* D. Don, *Solanum nigrescens* Mart & Gal., *Solanum rostratum* Dun., *Solanum triquetum* Cav.

Studies have been realized utilizing the techniques of Trease and Evans (1984). The transparention of the leaves have been done by adopting the technique of Johansen (1940) and Aguirre (1983), with some modifications. The number of stomatas, number of epidermal cells were counted from different fields and finally stomatal index was estimated for each species.

The pallisade ratio were estimated on the basis of the number of pallisade cells below four epidermal cells observed in four different fields (40X), thereby obtaining an average of pallisade cells per four epidermal cells. Descriptions have been made in relation with the shape of epidermal cells, types of stomatas, trichomes, and crystals.

Histochemical tests were realized following the techniques of histochemistry by Gayen y Datta (1983), Curtis (1986) and Maiti and Sanchez-Arreola (2000) , for the detection of proteins, starch, tannins, alkaloids, suberin, lipids and cellulose to evaluate the degree of reaction and staining intensity.

RESULTS AND DISCUSSIONS

The species presented diverse types of epidermal structures: trichomes observed are multicellular, umiseriate in *Datura inoxia*, *D. stramonium*, *Lycopersicon esculentum*, *Solanum nigrescens* and *S. rostratum*, widely distributed, and varying in its number among species observed. Besides, in *Physalis viscosa* , trichomes were branched, coinciding with that reported by Sabnis, cited by Metcalfe and Chalk (1950), stellate trichomes in *Solanum eleagnifolium*, are present on leaf surface as described by Vásquez et al. (1985), this type of trichome is present in *Solanum erianthum* and *S. rostratum*, varying in the number of branches. The majority of the species present glandular trichomes except *Nicotiana glauca* and *Solandra nitida* where trichomes were absent.

The shape of epidermal cells vary from irregular to square. The morphology of stomatas were of two types: anisocytic present in *Datura inoxia*, *D. stramoniu*, *Nicotiana glauca*, *Physalis viscosa*, *Solanum americanum* and *S. rostratum*; and anomocytic in *Lycopersicum esculentum*, *Solanum nitida*, *Solanum eleagnifolium*, *Solanum erianthum*, *S. nigrescens*, the same types of stomatas were reported in Solanaceae by Sabnis cited by Metcalfe y Chalk (1950). The crystals of different forms were observed: clustered in the form of sands in *Lycopersicon esculentum*, *Nicotiana glauca*, *Physalis viscosa*, *Solanum americanum*, *S. eleagnifolium*, *S. erianthum*, S. rostratum and S. triquetrum.; drusas in *Datura inoxia*, *D. stramonium*, *Physalis viscosa*, *Sandra nitida*, *Solanum orienthum*, *S. nigrescens*, *S. rostratum* and *S. triquetrum*. The prismatic types were observed only in the species of Datura, coinciding with that reported by Sabnis cited by Metcalf y Chalk (1950) and Trease and Evans (1976 and 1987). In the transverse section of the leaf, the majority of the species present one layer of pallisade parenchyma, except in *Datura stramonium*, *Solandra nitida* and *Solanum erianthum*. Therefore, the size and form of trichomes,crystals, types of stomatas and epidermal cells vary widely among species of *Solanum*, as mentioned by Fahn (1978) and Vázquez, (1985). Six species studied, showed the following anatomical characteristics: *Solanum elaeagnifolim* and *S. rostratum* presenting stellate shaped, glandular trichomes and irregular epidermal cells, distinguishable by the number of the rays of trichomes. For example, the number of rays vary in different species in *Solanum rostratum* (4-9), *S. erianthum* (4-12) and in *S. elaeagnifolium* (9-16) arms; other distinct characteristics are drusa type crystals as present in *S. erianthum*, *S. rostratum* and absent in *S. eleagnifolium*, where only cluster type of crystals in the form of sands are present. The species *Solanum americanum*, *S. nigrescens* and *S. triquetrum* may be differentiated easily from S. elaeagnifolium, S. erianthum and S. rostratum due to the fact that no stellate shaped trichomes were present and the trichomes were uniseriate except in Solanum americanum presenting glandular trichomes.

Comparing *Solanum americanum*, *S. nigrescens* and *S. triquetrum* it may be mentioned that *S. nigrescens* differs from *S. americanum* by the presence of 2-5 celled multicellular trichomes, while *S. triquetrum* possess 2-3 celled trichomes, majority of which are present on leaf margin; also presenting glands. *S. americanum* present distinct clusture type crystals in the form of sands, although in *S. nigrescens* the crystals are of drusa type and *S. triquetrum* presents both drusas type and clustered in the form of sands. The species of the genus *Datura* are characterized by anisocytic stomatas, glandular trichomes, non-glandular and drusa, differentiating *D. inoxia* from *D. stramonium* by the arrangement of drusa types in the form of “U” in *D. inoxia*, while in *D. stramonium* were distributed in dispersed form. Besides, the glandular trichomes in *D. inoxia* posssess stalk and unicellular head; in *D. stramonium* the stalk is bicellular and the head is multicelular, coinciding with with the observation by Trease and Evans (1984), they describe D. stramonium var. tatula, possess glandular trichomes of 1 or 2 cells; others with pedicells of 2 cells and with oval head of of 2 - 7 *cells*.

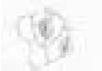
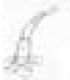
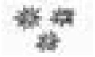
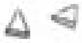
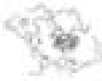
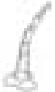
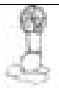
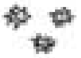
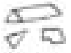
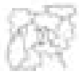
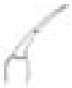
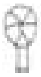
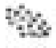
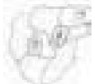
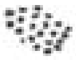
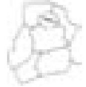
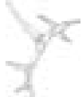
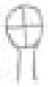
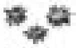
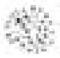
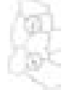
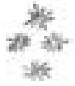
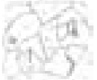
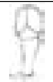
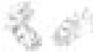
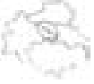
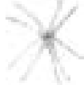
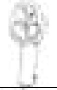
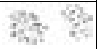
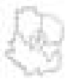
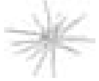
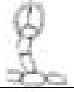
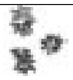
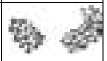
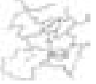
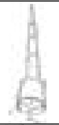
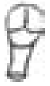
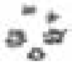
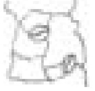
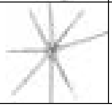
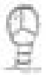
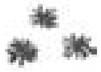
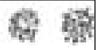
In addition to the qualitative characters, the species show large variations in quantitative characters. the majority of the species studied present varaitions in the the contents of protein, alkaloids. With respect to protein, the degree of reaction in *Solanum americanum*, *Physalis viscosa* and *Solanum nitida* differ in the majority of species (Table 2).

With respect to tannins, the species with high tannins are: *Datura stramonium*, *Nicotiana glauca*, *Solandra nitida*, *Solanum americanum* and *S. triquetrum*. Higher quantity of alkaloids are observed in the species of *Datura inoxia* and *D. stramonium*. The starch contents were present in intermediate form. The lipids were detected only in Solanum nitida. In the tests of suberin and cellulose, variations were observed among different species. Through histochemical tests following the techniques of Johansen, 1940, it is confirmed that the family Solanaceae is rich in alkaloids, coinciding with that reported by Domínguez (1979)

CONCLUSIONS

The species studied showed wide distributions, frequently occuring as weeds; considering as important medicinal plant resource within the reach of the community. Utilizing the techniques of pharmacognosy of the species it is observed that the most important anatomical characters are types of stomatas, non-glandular, and glandular trichomes and crystal types. For example, the species *Solanum americanum* and *S. nigrescens* are

Table 1. Anatomical characteristics of leaf epidermal cells and crystals in 12 species of the family Solanaceae.

Species	Stomata	Trichom-non-glandular	Trichome-glandular	Cristal-drusa	Crystale-Prismátic	Crystal-sand type
***Datura inoxia* Mill.**						
***Datura stramonium* L.**						
***Lycopersicon esculentum* Mill.**						
***Nicotiana glauca* Grah.**						
***Physalis viscosa* L.**						
***Solandra nitida* Swartz**						
***Solanum americanum* Mill.**						
***Solanum elaeagnifolium* Cav.**						
***Solanum erianthum* D.Don.**						
***Solanum nigrescens* Mart & G al.**						
***Solanum rostratum* Don.**						

frequently confused for their similarity in morphological characters, but these can be differentiated on the basis of epidermal structures. At the same time three species of the genus *Solanum* possess stellate trichomes, differing between them in the disposition and the number of arms.

The species of the genus *Datura* may be easily distinguished by the disposition of crystals and glandular trichomes. Through histochemical tests may be detected the presence of chemical substances in the leaves which confirms that family Solanaceae is rich in proteins, tannins, alkaloids and other compounds , which vary among different species. These results may serve to relate with their medicinal values.

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